

**ATTORNEY DOCKET NO.: LMX-118-DIV**

**UNITED STATES PATENT APPLICATION**

**OF**

**HEINRICH LANG, ET AL.**

**FOR**

**FILLABLE AND STIFFENED REARVIEW MIRROR ASSEMBLY**

**Fillable and Stiffened Rearview Mirror Assembly**

**RELATED APPLICATION**

5 The present application is a divisional application based on co-pending U.S. Patent Application No. 09/652,298, filed August 29, 2000, which claims priority under 35 U.S.C. § 119 to German Patent Application No. 10022017, filed May 5, 2000, in the  
10 German Patent Office.

**BACKGROUND OF THE INVENTION**

The invention concerns a rear view mirror arrangement, especially an outside mirror  
15 for commercial vehicles.

Outside mirrors of this kind and of variously different construction, are already known in the present state of the technology. A mirror pane is adjustably affixed by a pivoting mechanism to a housing part, which is appropriately connected to the body of the vehicle, allowing the mirror to swing in reference to the housing part. The housing  
20 part is, as a rule, a solid plastic part, produced by injection molding. It is generally of a basin-like construction in which further mirror components or corresponding connection points for additions are installed. In particular, for large truck and bus mirrors, the carrying structure for outside mirrors is based on tubing or plates, which are affixed directly to the mirror holder which projects toward the vehicle body. This construction is  
25 disclosed by EP-A-0 590 510. The housing part serves then as a covering of the back side

of the mirror plate and supports the pivoting mechanism. The housing also provides a streamlined sheathing of the outside mirror. Such construction is extremely expensive and heavy.

5 A problem with this tube and plate construction is found in that relatively strong vibrations occur in the rearview mirror assembly during the operation of the vehicle. In order to reduce these vibrations, EP 0 865 967 A2 proposes a carrying tube structure, encased in a foamed molded part. Again, the disadvantage of this is that the entire carrying structure is very heavy.

10 A very light design, which is adaptable to smaller mirrors, is taught by DE 44 29 604 A1. In this case, the tube construction is fully dispensed with and the foam element itself remains as the carrying structure. For this purpose, a gradiated foam is employed as a one-piece element or the carrier comprises several shells.

### **OBJECTIVES AND SUMMARY OF THE INVENTION**

15 The objective of the present invention is to make available a sufficiently stable rearview mirror, which, in any case, exhibits the least possible tendency to vibrate. This purpose is accomplished by the features of the invention.

20 Because at least one hollow space in the carrier is filled with a filling material(also called fill material hereafter), which is composed of material other than that of the carrier, or which material possesses a density other than that of the carrier, it is possible to specifically target the vibratory tendencies of the carrier by the appropriate choice of filling material. Additionally the filling material can also lead to an improved stability of

the carrier, insofar as the filling material binds itself to the inner wall of the carrier or the interior surface of the hollow space.

A plurality of hollow spaces within the carrier can purposely be provided at specific locations. The choice of the locations is done empirically, wherein the effort is made to  
5 bring about the greatest possible damping of the vibration.

The carriers with hollow spaces can be made by injection molding, foam processing such as a thermoplastic, integral foam, or blow molding, including extrusion blow molding. In these methods, for the applicable shape of the hollow spaces, negative shapes are inserted, which are patterned after the desired form.

10 In accord with an advantageous embodiment of the invention, for additional stabilization, stiffening structures are installed in at least one hollow space. This, in a first instance, can be brought about by inserting a separate component into a hollow space, or, in a second instance, in that the wall structure of the hollow space is provided with reinforcing ribs.

15 In accord with another advantageous embodiment of the invention, the filling material in the hollow spaces consists of plastic foam, such as polyurethane foam, gradient foam, multi-component hard foam and the like, which binds itself firmly with the interior walls of the hollow spaces, thus increasing the stability of the carrier. Moreover, by means of an appropriate choice of foam density, or by the resilience  
20 thereof, the vibratory behavior of the carrier can be so positively affected that during

commercial travel, the inevitable vibrations are strongly damped and, as a result, the abrasion therefrom is reduced.

Additionally, or alternatively, it is possible to fill in the hollow space or spaces, or a part thereof, with a viscous material, in particular a gel or a gelatin-like material. In this way, likewise, the vibrations and the damping are specifically influenced.

In accord with a further advantageous embodiment of the invention, a granulate and/or sand may be additionally or alternatively placed in the hollow spaces or in a part thereof. In this way, the fill material can be comprised exclusively of sand or granulate, or a mixture thereof, or yet of a mixture with the above described gel, gelatin or foam. Once again, the stability is favored in a positive way and again the specific vibratory and damping characteristics can be advantageously controlled with attention to specifics.

#### **BRIEF DESCRIPTION OF THE DRAWINGS**

Further details, features and advantages of the invention will become evident from the following description of preferred embodiments. The description is made with the aid of the drawing. There is shown in:

Fig. 1a a schematic sideview of a first embodiment of the invention with a carrier in the form of a blown plastic, hollow body with a single, continuous hollow space, which is incorporated in foam,

Fig. 1b a sectional view along the line A-A in Fig. 1a,

Fig. 2a a perspective view of a second embodiment of the invention with a rearview mirror which possesses a carrier with of two integral support arms,

Fig. 2b a sectional view along the line B-B in Fig. 2a,

Fig. 3 a schematic sideview of a third embodiment of the invention with a carrier in the form of a plastic, hollow body with a plurality of hollow spaces, and

5 Fig. 4 a partial sectional view of a fourth embodiment of the invention with a carrier constructed of a blown plastic, hollow body with additional stiffening structural members.

**DESCRIPTION OF THE PREFERRED EMBODIMENT**

10 Reference will now be made in detail to the presently preferred embodiment of the present invention, an example of which is illustrated in the drawings. The example is provided by way of explanation of the invention and is not meant as a limitation of the invention. For example, features illustrated or described as part of one embodiment can  
15 be used on another embodiment to yield yet a third embodiment. Accordingly, it is intended that the present invention include such modifications and variations.

The Figs. 1a and 1b show, in a schematic manner, a first embodiment of the invention. The rearview mirror incorporates a carrier 2 in the form of a plastic hollow body 2, which was blow formed from an extruded plastic blank. The carrier 2 possesses a  
20 closed wall 4, which envelopes a hollow space 6. On the vehicle end of the plastic hollow body 2 are provided holes for screws 8. These fastening means bind the rearview mirror arrangement to the body of the vehicle. On the end of the plastic hollow body 2 remote from the said body, in respective recesses are mounted a first mirror 10 and a second mirror 12. Both mirrors include, respectively, an adjustment mechanism 14, 16,  
25 by means of which the corresponding mirror is mounted on the plastic hollow body 2. The wall 4 of the plastic hollow body 2 is made thicker at positions of greater stress than

is the corresponding thickness at positions of less stress (not shown). As is indicated in Fig. 1b by means of dotted areas, the entire hollow space 6 is foam filled with a foam material 18, this being, for instance, a polyurethane foam, a gradient foam, or the like.

The Figs. 2a and 2b show a second embodiment of the invention with a carrier 20, which has a shell-like mirror housing 22 and parallel upper/lower support arms 24, 25 extending away from said mirror housing 22. The two support arms 24, 25 are hollow and possess respectively a hollow space 26, which is filled with filling material 28. The carrier 20 incorporates on the end of the mirror housing 22 remote from the vehicle, a third hollow space 29, which extends itself longitudinally along the rim of the mirror housing 22, this hollow space being likewise packed with foamed fill material 28.

For the filling material 28, preferably polyurethane foam, gradient foam, multi-component hard foam or the like can be employed. By the insertion of the foam into the hollow spaces 26 and 29, first, the stability is improved, since the foam in the hollow spaces 26 and 29 binds to the inner walls, i.e. adheres thereto.

Second, by means of said insertion of foam, the vibration behavior is positively influenced, that is, the vibrations are damped.

Fig. 3 illustrates a third embodiment of the invention, showing a foam carrier 30, which incorporates a plurality of bubble shaped hollow spaces 32 and 34. In this case, the bubble shaped hollow spaces 32 are empty, while the bubble shaped hollow spaces 34 are filled with a filling material 36. Because of the plurality of the hollow spaces 32, 34, first, the weight is reduced and second, by means of the dividing walls 33 between the

hollow spaces 32, 34, the stability is increased. By means of the filling of a portion of the hollow spaces, namely the hollow space 34 with a filling material 36, the vibratory properties of the mirror assembly are influenced in such a way, that less vibration occurs.

That is, the vibrations are damped. Additionally, in the case of the third embodiment,

5 carrier arms 38 of metal are provided, by means of which the stability of the carrier 30 is additionally increased.

Fig. 4 shows a fourth embodiment of the invention, with a carrier 40 in the form of a hollow plastic body, in which grid-type stiffening ribs 42 have been provided. The hollow plastic body 40 encapsulates a continuous hollow space 44, which is partially  
10 filled with a gel 46 as a filling material. The partial filling of the hollow space 44 with gel 46 is illustrated by a dotted line. The grid shaped stiffening ribs 42 are made by fashioning corresponding wall thicknesses in the original plastic blanks before the blowing of these blanks in the blow-mold. By means of the grid-like stiffening ribs 42, the stability is increased. Because of the gel 46 and the degree of the filling thereof in the  
15 hollow space 44, the damping behavior can be specifically influenced.

It will be apparent to those skilled in the art that various modifications and variations can be made in the present invention without departing from the scope and spirit of the invention. It is intended that the present invention include such modifications and variations as come within the scope of the appended claims and their equivalents.